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A PLANE GLASS RETINOSCOPE

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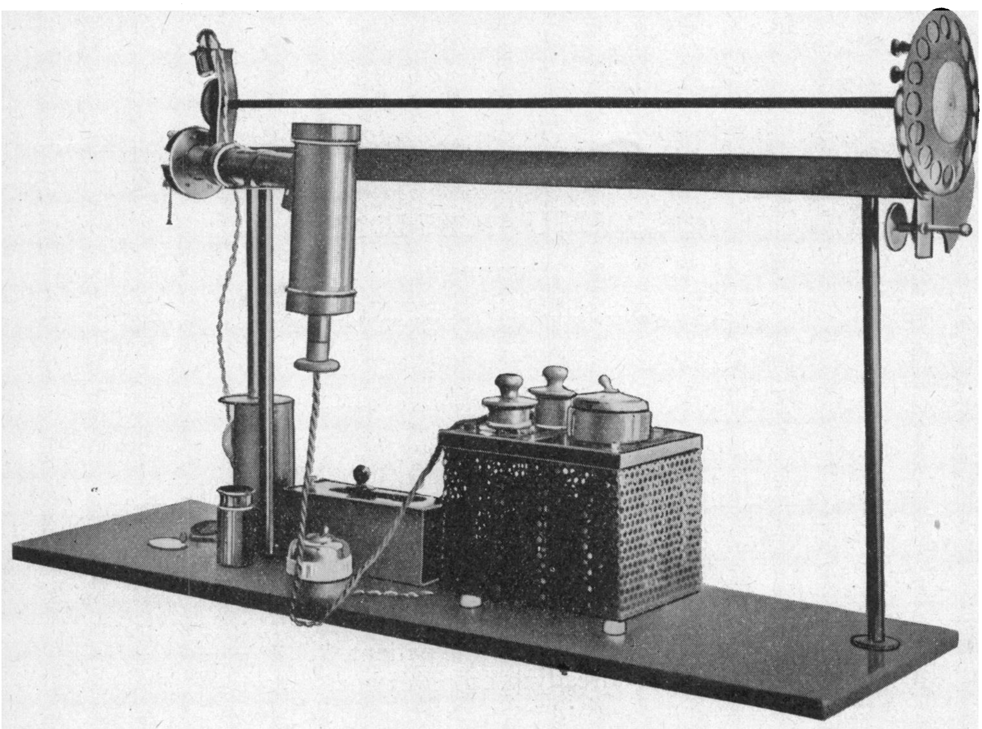
THIS instrument has been designed with a view to the performance of retinoscopy at the macula in cases where a mydriatic has not been used. Such a procedure is not possible with the usual retinoscopy mirror on account of pupillary contraction, and the large size of the corneal reflex. One has to resort to some form of eccentric fixation on the part of the patient. A short description of this instrument has already been published. I have introduced several modifications and improvements.

The optical system employed is shown in Fig. 1 (which is not drawn to scale).

A is the source of light, a 30 c.p. Pointolite lamp. B is a microscope condenser which forms a much reduced image of the source on a minute stop in the diaphragm C. D is a 5D convex lens placed 20 cm. from C converting the rays emerging from this point into a parallel beam. E is a thin piece of plane glass which reflects a portion of this light down the tube F into the patient's eye G.

The observer seated behind E and looking down the tube sees a yellow red reflex from the patient's pupil, and on moving his head from side will note a movement in the "shadow" similar to that seen in retinoscopy with a plane mirror, i.e., in hypermetropia, and in myopia of less than 1D, the "shadow" appears to move across the patient's pupil in the same direction as that in which the observer moves his head, while in myopia of more than 1D the direction of the movement is reversed.

In order to facilitate lens changing, a series of lenses has been mounted in two discs at the patient's end of the instrument. These discs are rotated by two milled heads placed within easy reach of the observer. The discs and milled heads can be seen



in the photograph. There is also at the patient's end an adjustable ivory knob, which he is directed to place against his cheek so as to keep the eye at a constant distance from the plane of the lenses. The latter are tilted 10° from the vertical so as to prevent the observer seeing the reflection they form of the source of light. The astigmatism thus produced is so slight as to be almost negligible. When an 8D lens is tilted 10° the cylindrical correction is only 0.217D and with a 16D lens it is 0.49D. The effect can, therefore, be neglected as being within the limits of experimental error. Thus no light enters the observer's eye, except that from the patient's fundus, the reflection from the cornea being so minute as to be invisible.

The instrument is provided with several adjustments, but once set up there is no need to make any alterations. The lamp contained in a light-tight casing can be moved up and down, and from side to side, the same is true of the stop C, while the microscope condenser and the 5D lens can be moved backwards or forwards for focusing purposes. The plane glass is held in position by three adjustable screws, and can be tilted into the desired plane, so as to project the reflected beam of light straight down the tube to the patient's eye. At first sight it may seem a little odd for the observer to move his head rather than the plane glass; in practice, however,

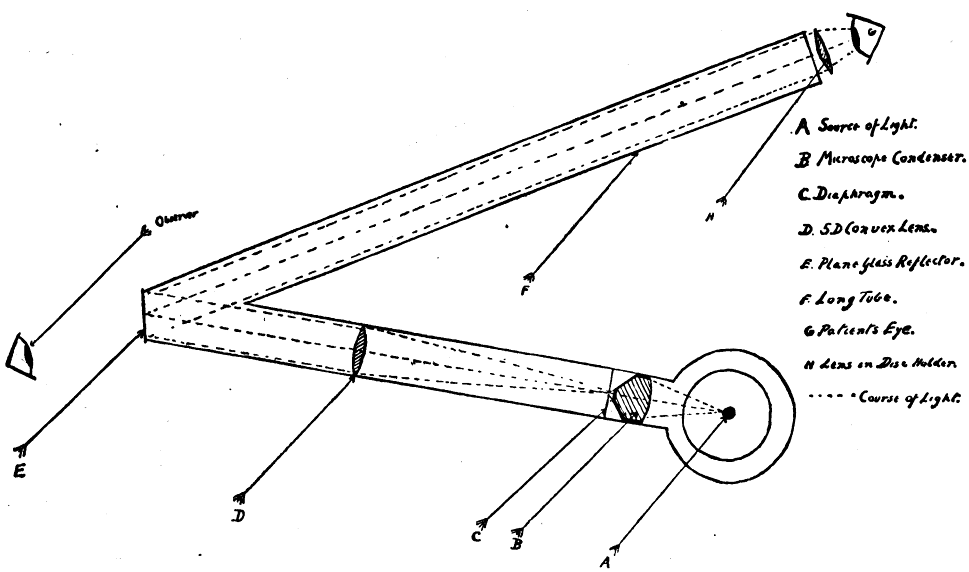


FIG. 1.

this method has been found to give better results than are obtained by tilting the glass.

In the usual performance of retinoscopy the observer automatically accommodates for the patient's pupil. With this instrument, however, the patient is in darkness, and there is no stenopaic effect such as is produced in the small hole in the usual retinoscopy mirror, hence one may not be accurately focused for the plane of the pupil. I have found that this makes a distinct difference in the values obtained. Thus, in my own case, using a Frost's model eye set at emmetropia, if I accommodate for the artificial pupil, neutralization is affected with a +1D sphere, if, however, I relax my accommodation and allow my hypermetropia (1D) to become manifest the outline of the artificial pupil of course becomes blurred, but it requires a + 1.50D sphere before neutralization is effected. I, therefore, find that the most satisfactory results are obtained by adding +1D to one's distance correction, and by wearing this glass while using the instrument. The same thing occurs if one tilts the glass instead of moving one's head. It is impossible, however, to elicit the phenomenon using the ordinary retinoscopy mirror and a source of diffuse light either with the model eye or with a patient.

It is a little difficult to explain this phenomenon from the theoretical side and I only wish to make a tentative suggestion. It must depend on the use of a strictly parallel beam of rays. This will give a very small definite image on the fundus of the observed eye when it is emmetropic or nearly so. When this small, sharply defined, illuminated area of retina is viewed through the refracting media of the observed eye, it is seen as a virtual image, provided there is hypermetropia, or myopia of less than 1D. Now, in all conditions of refraction when the source of light (real or virtual) is moved, this area moves in the opposite direction, i.e. in the same direction as that in which the plane mirror is tilted. At the point of reversal one seems to lose sight of this image, and to see another apparently in the plane of the patient's pupil moving in the opposite direction. If, however, reversal has been obtained with the observer's eye accommodated for the plane of the patient's pupil and the observer then relaxes his accommodation and allows say 1D of hypermetropia to become manifest, the image formed by the source of light on the patient's fundus is again visible, and it takes a further increase in the plus strength of the lens in front of the patient's eye for the apparent movement to be reversed. Presumably this is because the observer's eye when hypermetropic is able to focus more strongly convergent rays and so can keep the virtual image of the patient's fundus in view when it would not be possible for a myopic or emmetropic eye to do so.

It should be stated that this effect is not so noticeable when a living eye is under examination as it is when the model eye is used, but it can be detected if carefully looked for, and if the observer deliberately relaxes his accommodation. If unrecognized it is a possible source of error, and it therefore seems better to wear a correction as already described. That it does not occur under the ordinary conditions of retinoscopy may be due to the fact that one is here dealing with a larger and more diffuse retinal image which is not so readily recognized by the observer's eye.

The instrument described has been made for me by Messrs. Dixey and Son, to whom I am much indebted for the care and trouble they have taken. It has given good results in practice, and its use effects a considerable saving of time.